

WE CLAIM:

1. An integrated circuit having copper interconnecting metallization protected by a first overcoat layer,  
5 portions of said metallization exposed in a window opened through the thickness of said first overcoat layer, comprising:
  - a patterned conductive barrier layer positioned on said exposed portion of said copper metallization  
10 and on portions of said first overcoat layer surrounding said window;
  - a bondable metal layer positioned on said barrier layer, the thickness of said bondable layer suitable for wire bonding; and
  - 15 a second overcoat layer surrounding said window so that the surface of said second overcoat layer at the edge of said window is at or above the surface of said bondable layer.
2. The circuit according to Claim 1 wherein said first  
20 overcoat thickness is from about 0.6 to 1.5  $\mu\text{m}$ .
3. The circuit according to Claim 1 wherein said first overcoat comprises one or more layers of silicon nitride, silicon oxynitride, silicon dioxide, silicon carbide, or other moisture-retaining compounds.
- 25 4. The circuit according to Claim 1 wherein said barrier layer comprises tantalum nitride.
5. The circuit according to Claim 1 wherein said barrier  
layer is selected from a group consisting of tantalum, titanium, tungsten, molybdenum, chromium, vanadium,  
30 alloys thereof, stacks thereof, and chemical compounds thereof.

6. The circuit according to Claim 1 wherein said barrier layer has a thickness between about 0.02 and 0.03  $\mu\text{m}$ .
7. The circuit according to Claim 1 wherein said bondable metal is aluminum or an aluminum alloy.
- 5 8. The circuit according to Claim 1 wherein said bondable metal layer has a thickness suitable for wire bonding.
9. The circuit according to Claim 8 wherein said bondable metal layer has a thickness between about 0.4 and 1.4  $\mu\text{m}$ .
- 10 10. The circuit according to Claim 1 further comprising a ball bond attached to said plug.
11. The circuit according to Claim 1 wherein said barrier and bondable metal layers overlap between about 0.1 and 0.3  $\mu\text{m}$  over said surrounding portions of said first  
15 overcoat layer.
12. The circuit according to Claim 1 wherein said second overcoat layer is an organic material selected from a group consisting of polyimide, benzocyclobutene, and related polymeric compounds.
- 20 13. The circuit according to Claim 1 wherein said second overcoat layer has a thickness between about 0.5 and 5.0  $\mu\text{m}$ .
14. The circuit according to Claim 1 further comprising a distance separating the edge of said second overcoat  
25 and the edge of said combined barrier and bondable metal layers.
15. The circuit according to Claim 14 wherein said distance is between about 3 and 6  $\mu\text{m}$ .
16. A wafer-level method of fabricating a metal structure  
30 for a contact pad of an integrated circuit having copper interconnecting metallization protected by a first overcoat layer including insulating silicon

compounds, comprising the steps of:

opening a window through the thickness of said  
first overcoat layer to expose portions of said  
copper metallization;

5 depositing a barrier metal layer over said wafer to  
cover said exposed copper metallization and first  
overcoat surface;

depositing a bondable metal layer over said barrier  
layer in a thickness sufficient to fill said  
10 overcoat window and to enable wire ball bonding;  
patterning both said deposited metal layers so that  
only the layer portions inside the window and  
over a first overcoat area close to the window  
perimeter remain;

15 depositing a second, organic, light-sensitive  
overcoat layer over said wafer so that the  
surface of said second overcoat at the edge of  
said window is at or above the surface of said  
bondable layer; and

20 selectively removing said second overcoat layer from  
said bondable metal layer to expose said bondable  
metal for the process of wire bonding.

17. The method according to Claim 16 wherein said step of  
selectively removing said second overcoat layer

25 comprises the steps of:

selectively photo-exposing said second overcoat  
layer over said contact pads, applying the depth  
of focus; and

30 removing the photo-exposed portions of said second  
overcoat layer to expose said bondable  
metal.

18. The method according to Claim 17 wherein said depth of focus is applied to create a distance which separates the edge of the remaining second overcoat from the edge of said bondable metal.

5 19. The method according to Claim 16 wherein said step of depositing said second overcoat layer comprises a spin-on process.

10 20. The method according to Claim 16 said second overcoat is an organic material selected from a group consisting of polyimide, benzocyclobutene, and related polymeric compounds.

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